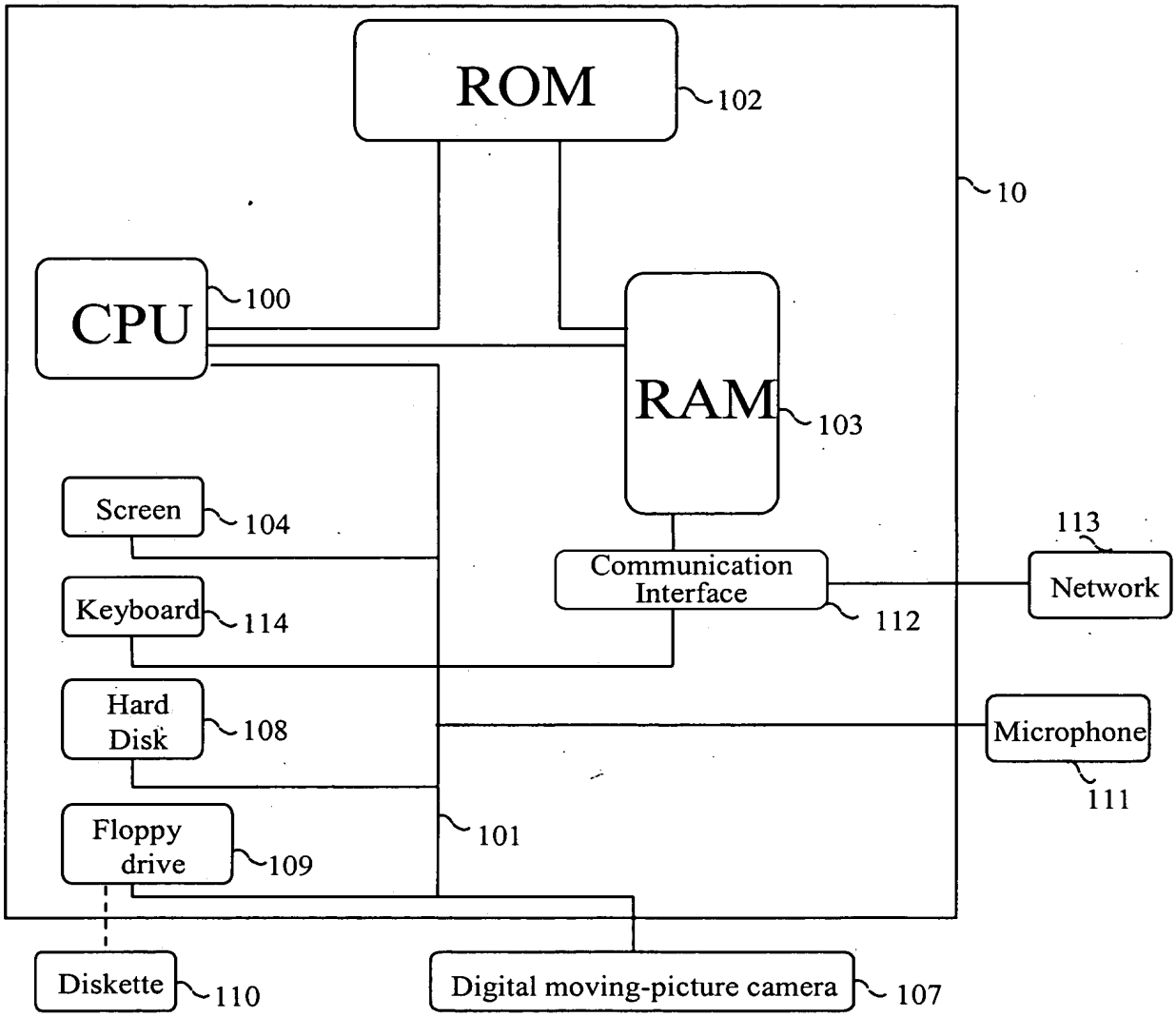
ROM
102
10
CPU
100
RAM
103
Screen
104
113
Communication Interface
Network
Keyboard
114
112
Hard Disk
108
Microphone
111
Floppy drive
109
101
Diskette
110
Digital moving-picture camera
107

Figure 1

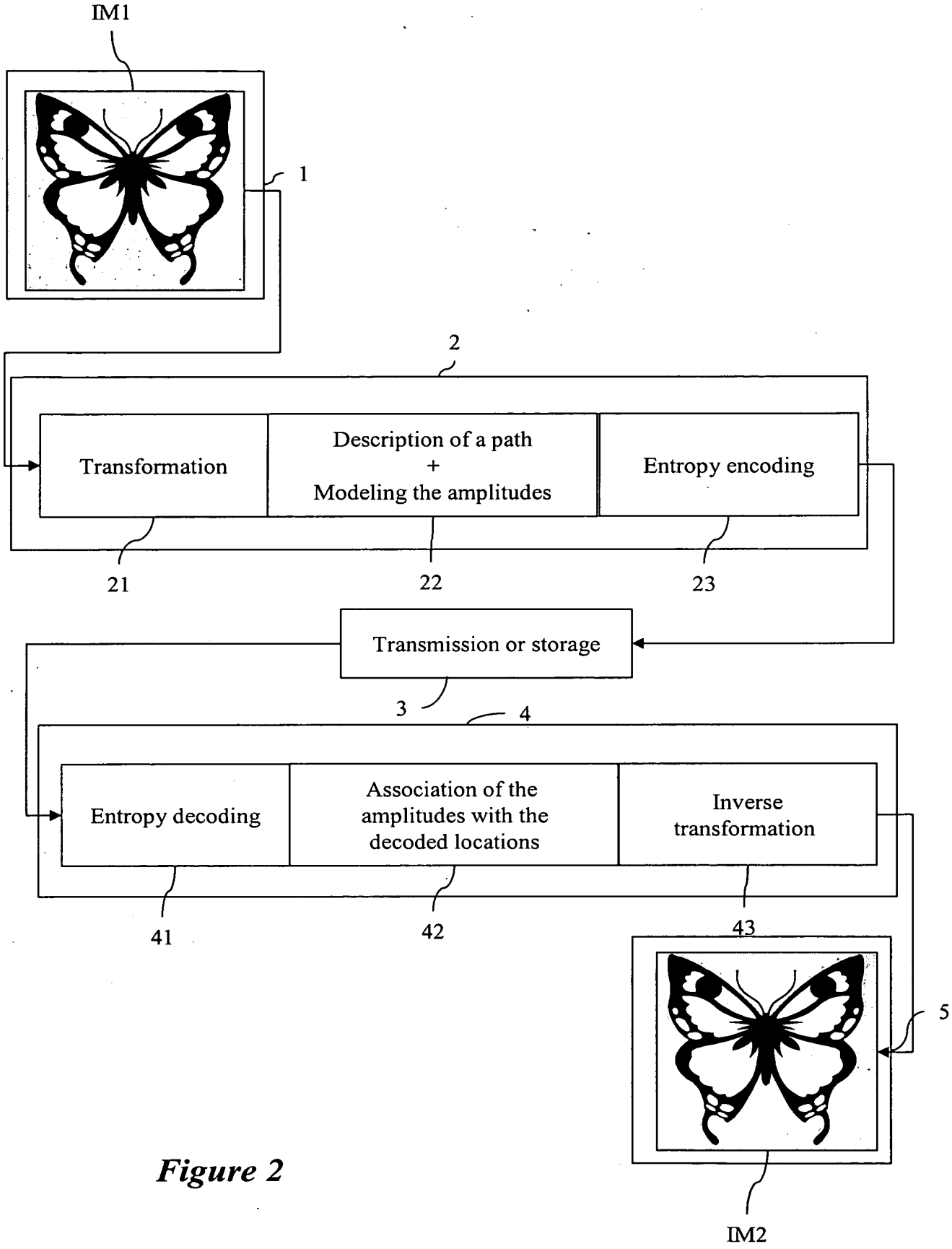
IM1
1
2
Transformation
Description of a path
+
Modeling the amplitudes
Entropy encoding
21
22
23
Transmission or storage
3
4
Entropy decoding
Association of the amplitudes with the decoded locations
Inverse transformation
41
42
43
5
IM2

Figure 2

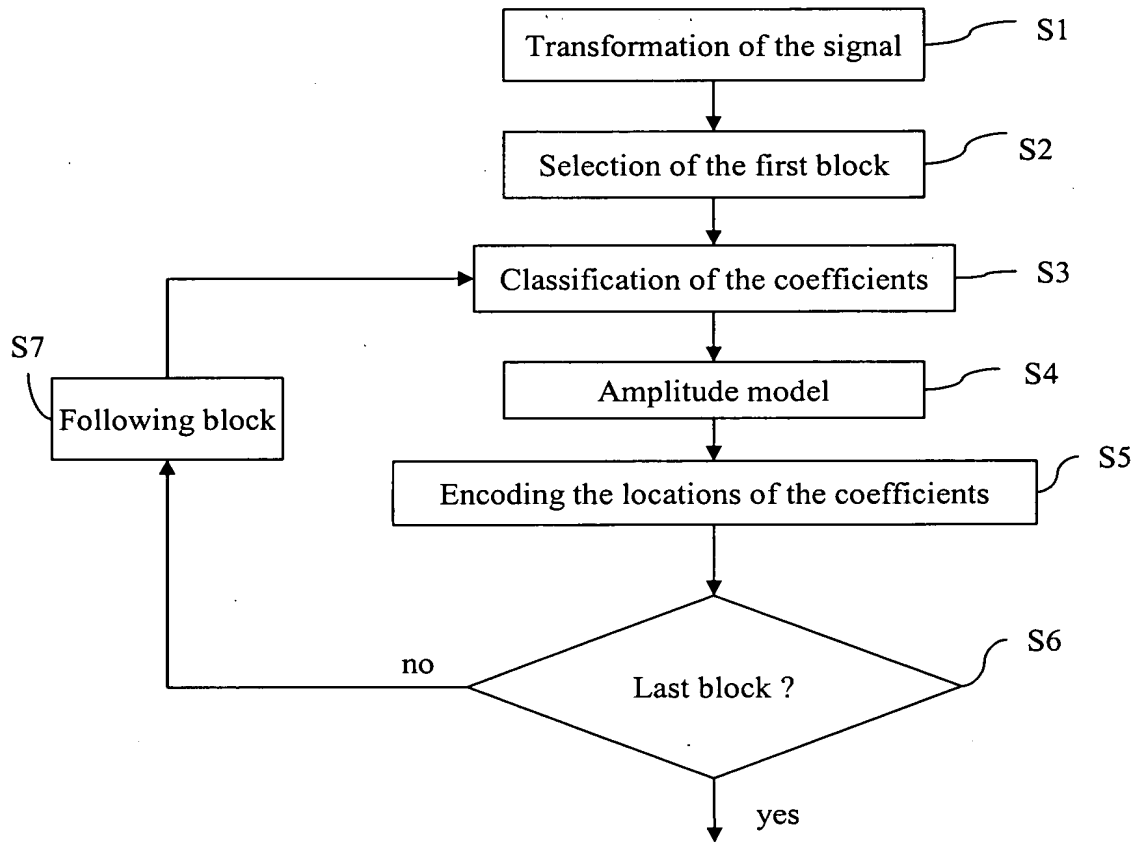
Transformation of the signal
S1
Selection of the first block
S2
Classification of the coefficients
S3
Amplitude model
S4
Encoding the locations of the coefficients
S5
Last block ?
S6
no
yes
Following block
S7

Figure 3

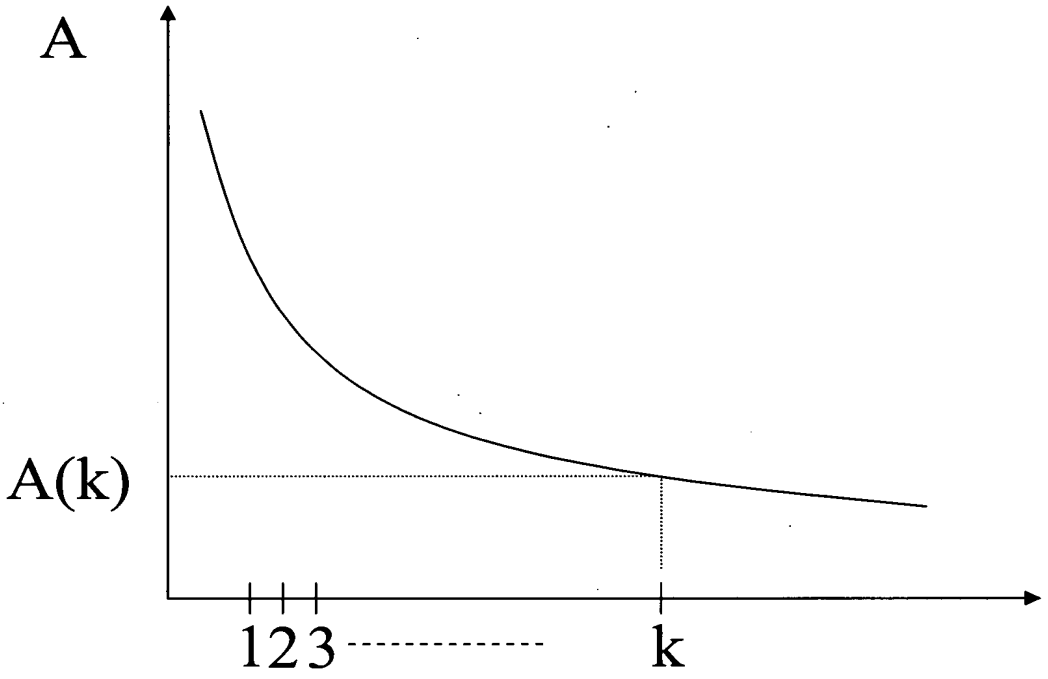

Figure 4

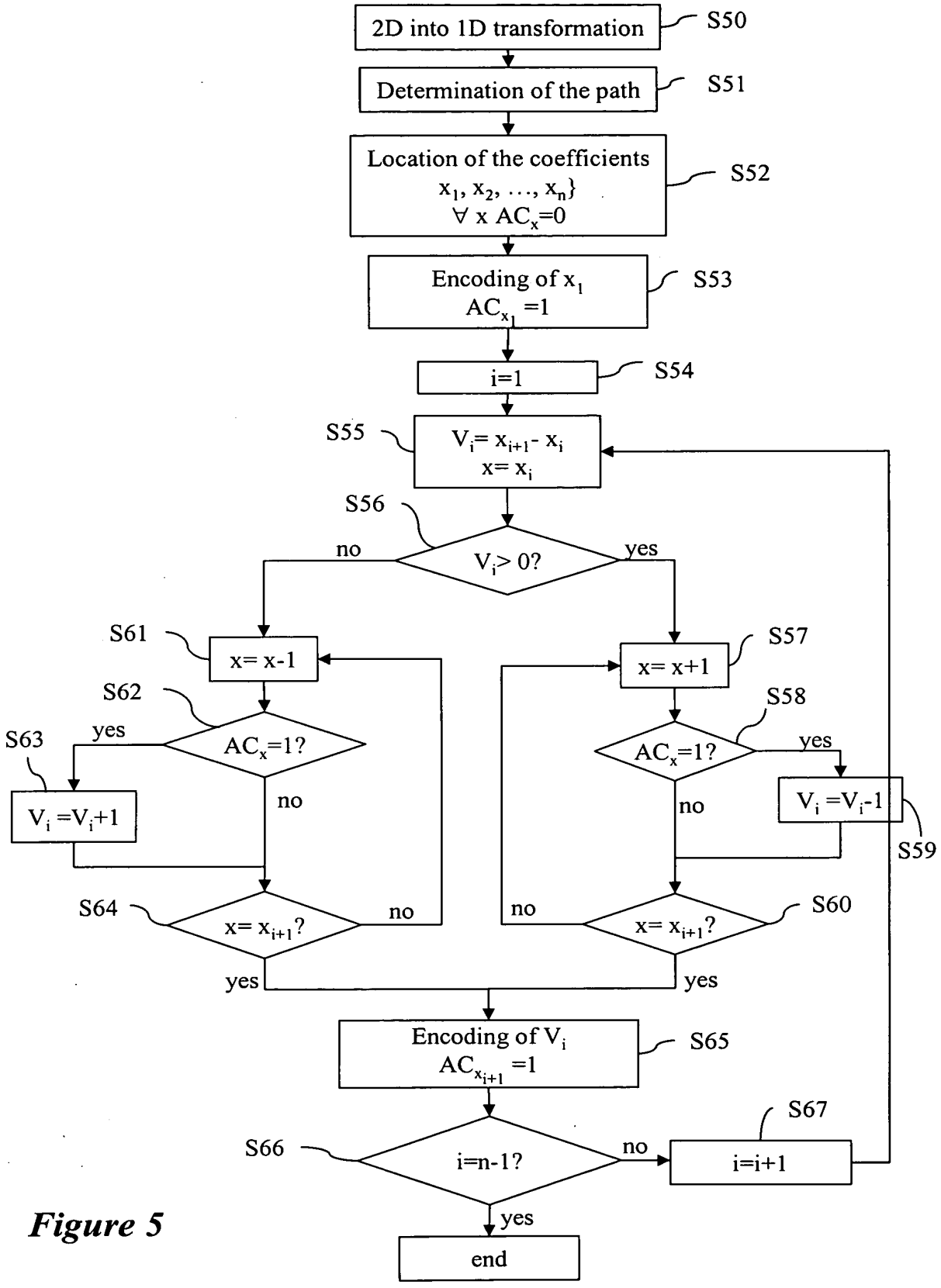
2D into 1D transformation
S50
Determination of the path
S51
Location of the coefficients
$x_1, x_2, \ldots, x_n\}$
$\forall$ x $AC_x=0$
S52
Encoding of x_1
$AC_{x_1}=1$
S53
i=1
S54
S55
$V_i= x_{i+1}- x_i$
$x= x_i$
S56
$V_i> 0?$
no
yes
S61
x= x-1
S57
x= x+1
S62
$AC_x=1?$
S63
yes
no
$V_i =V_i+1$
S58
$AC_x=1?$
yes
no
$V_i =V_i-1$
S59
S64
$x= x_{i+1}?$
no
S60
$x= x_{i+1}?$
no
yes
yes
Encoding of V_i
$AC_{x_{i+1}}=1$
S65
S66
i=n-1?
no
S67
i=i+1
yes
end

Figure 5

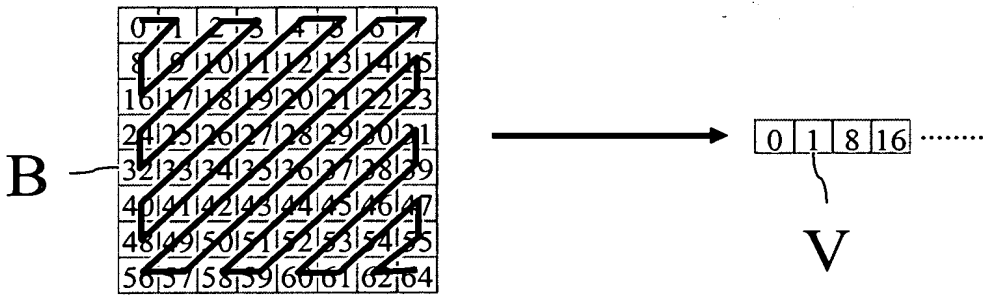

Figure 6

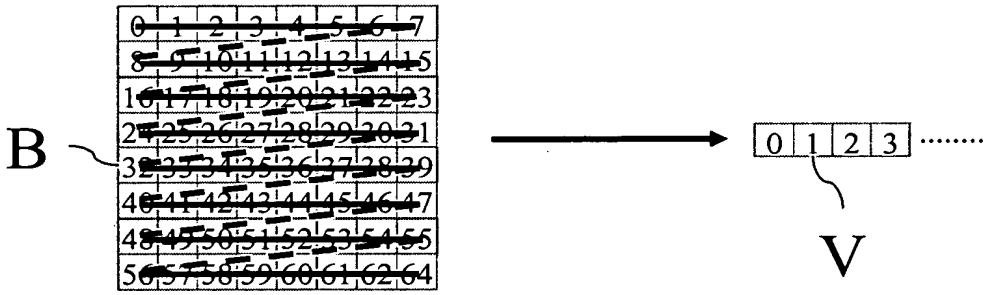

Figure 7

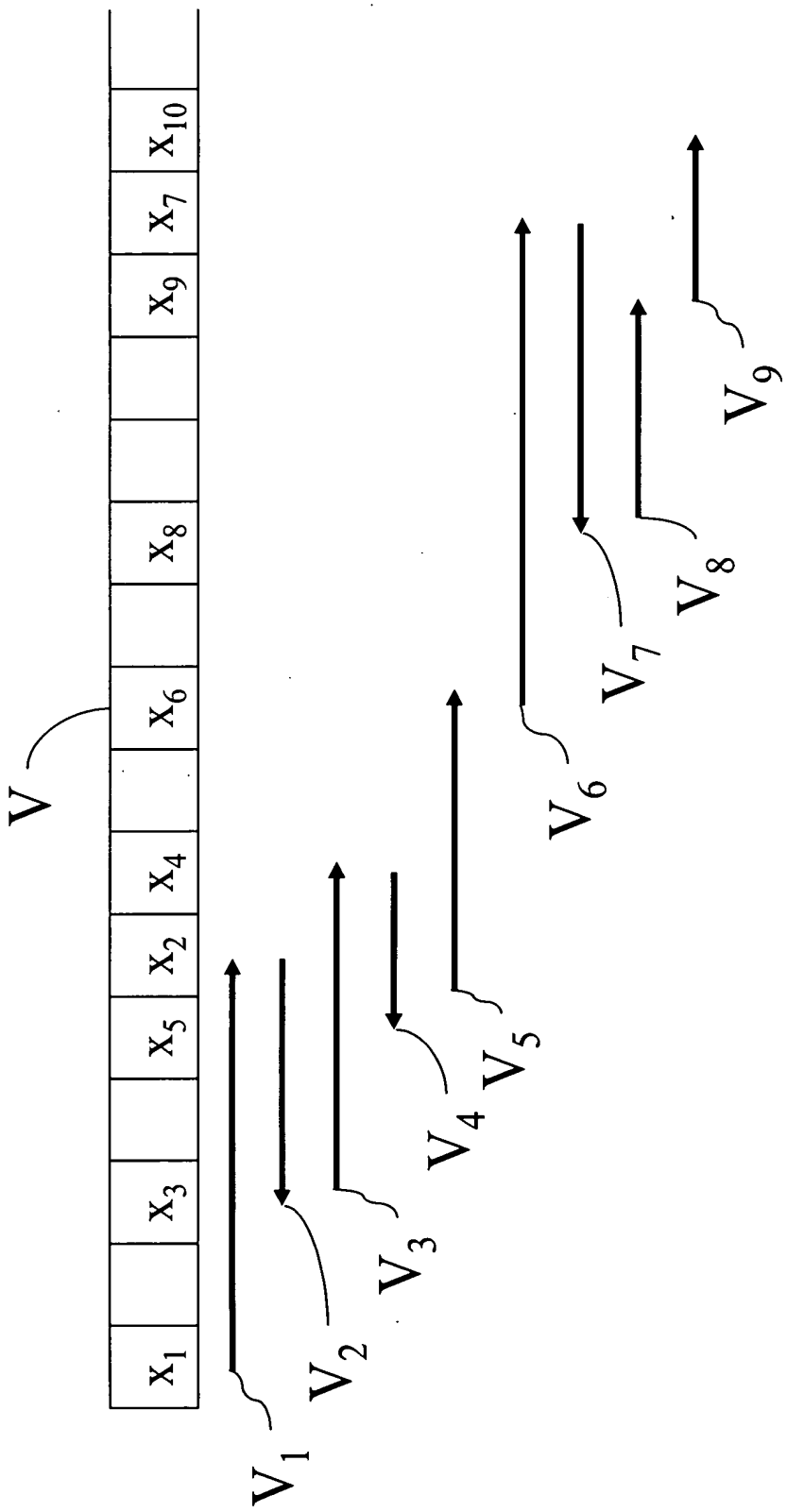

Figure 8

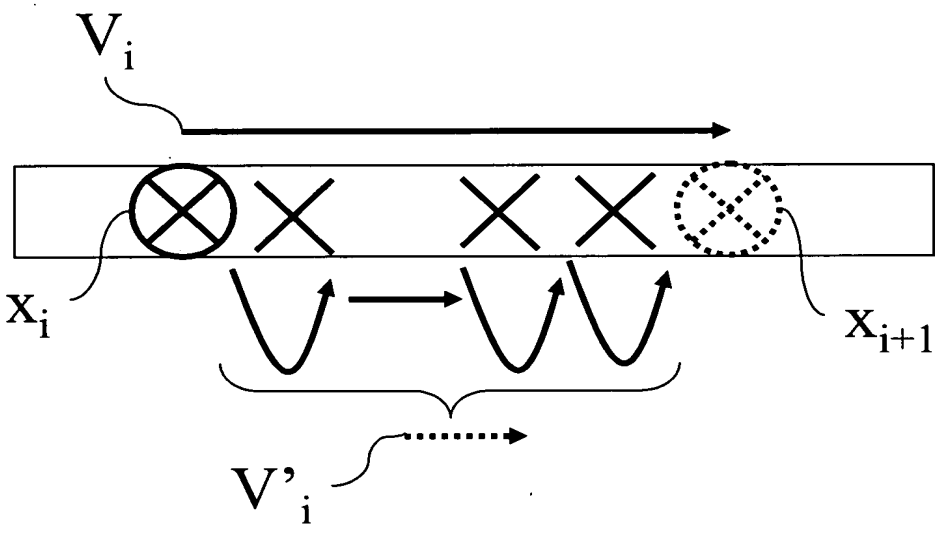

Figure 9

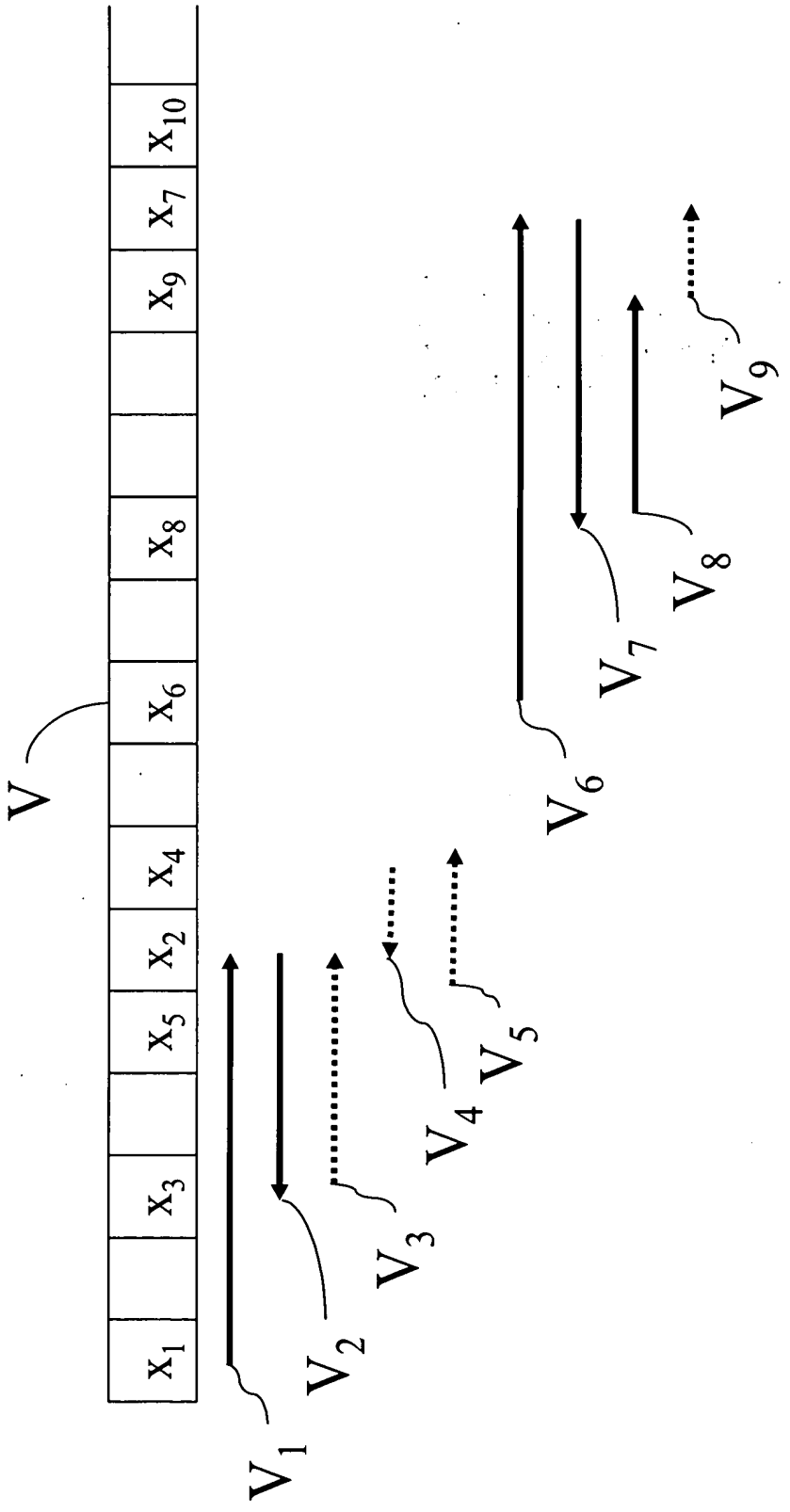

Figure 10

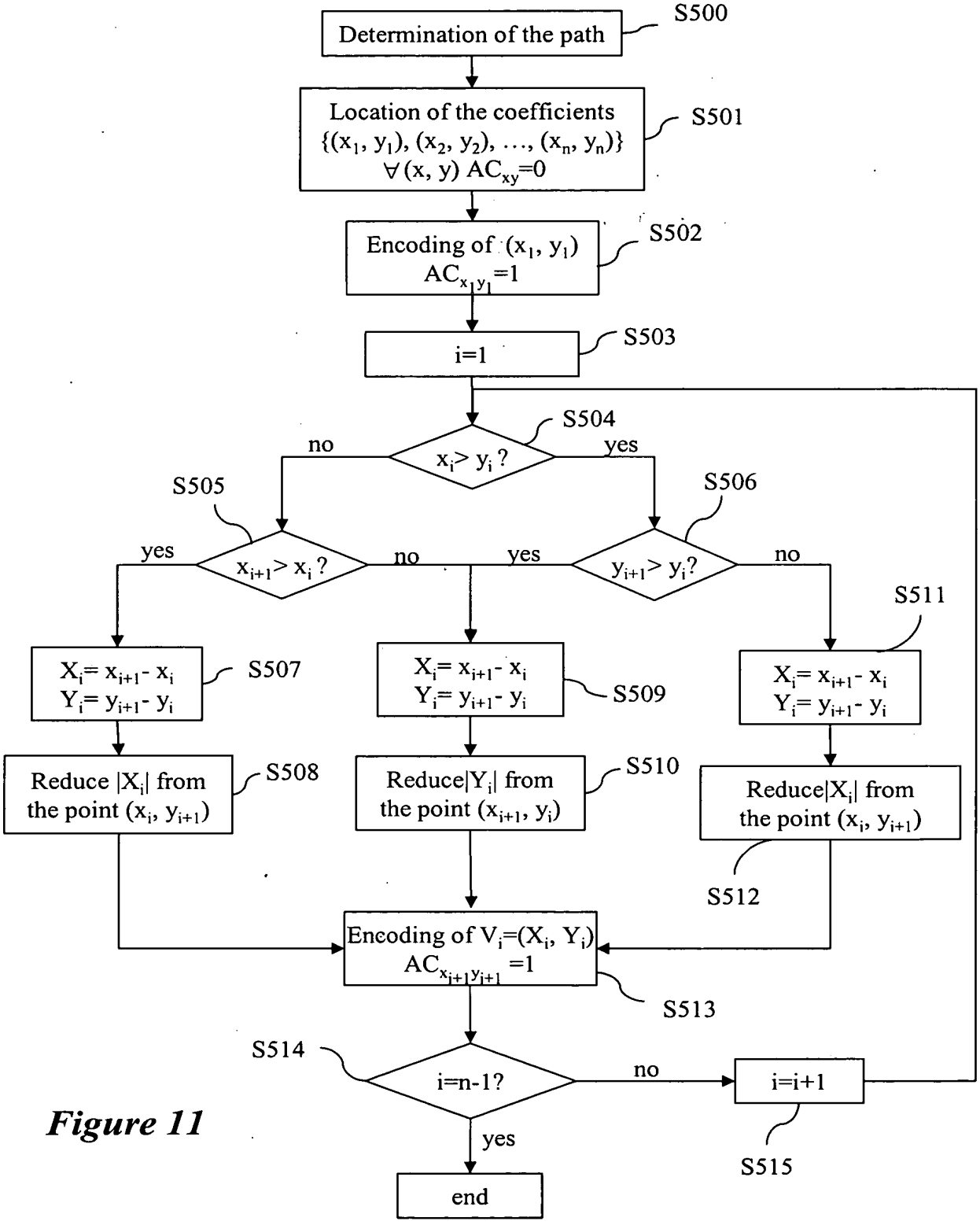
Determination of the path
S500
Location of the coefficients
{(x1, y1), (x2, y2), ..., (xn, yn)}
∀(x, y) ACxy=0
S501
Encoding of (x1, y1)
ACx1y1=1
S502
i=1
S503
S504
xi> yi ?
no
yes
S505
S506
xi+1> xi ?
yi+1> yi?
yes
no
yes
no
S511
Xi= xi+1- xi
Yi= yi+1- yi
S507
Xi= xi+1- xi
Yi= yi+1- yi
S509
Xi= xi+1- xi
Yi= yi+1- yi
Reduce |Xi| from
the point (xi, yi+1)
S508
Reduce|Yi| from
the point (xi+1, yi)
S510
Reduce|Xi| from
the point (xi, yi+1)
S512
Encoding of Vi=(Xi, Yi)
ACxi+1yi+1 =1
S513
S514
i=n-1?
no
i=i+1
S515
yes
end

Figure 11

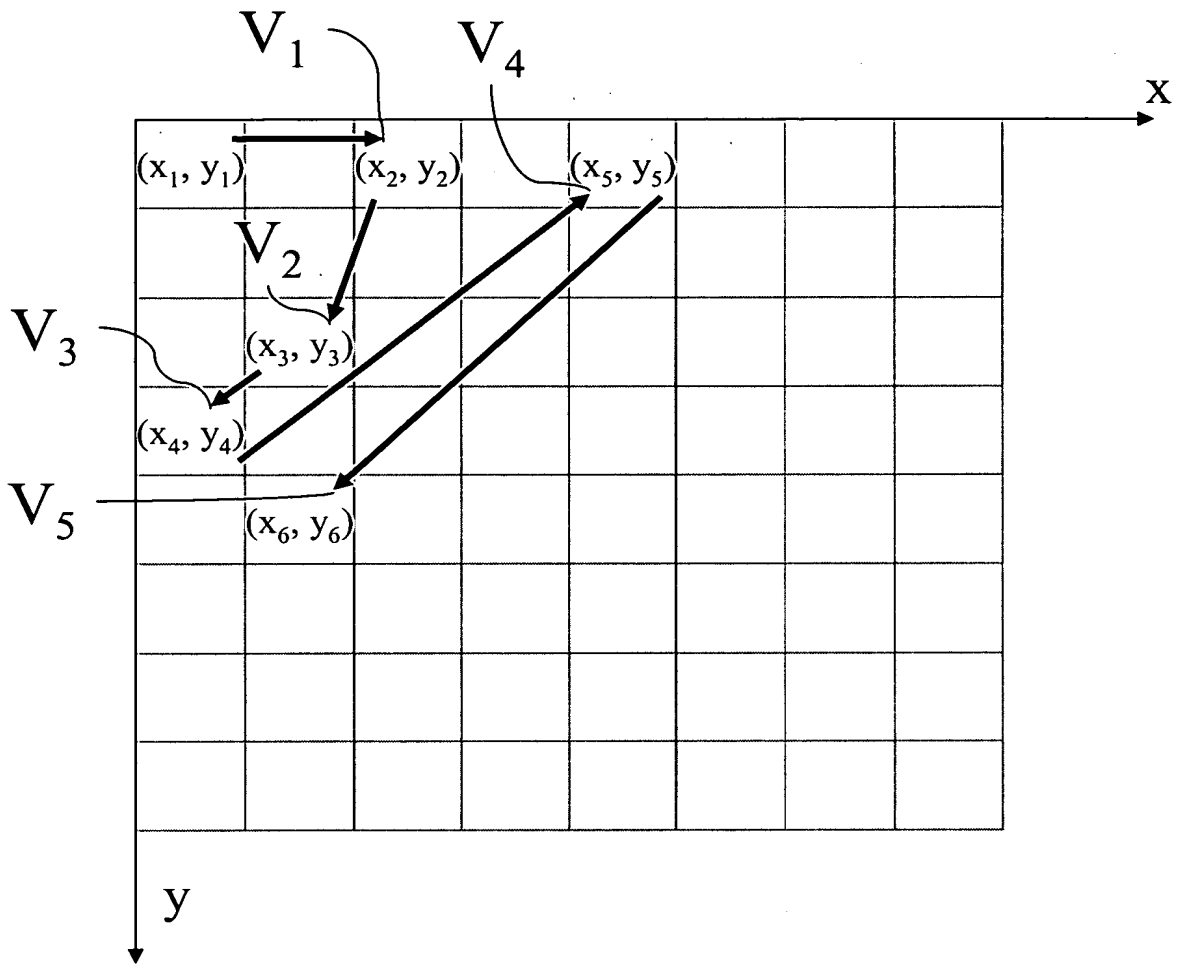

Figure 12

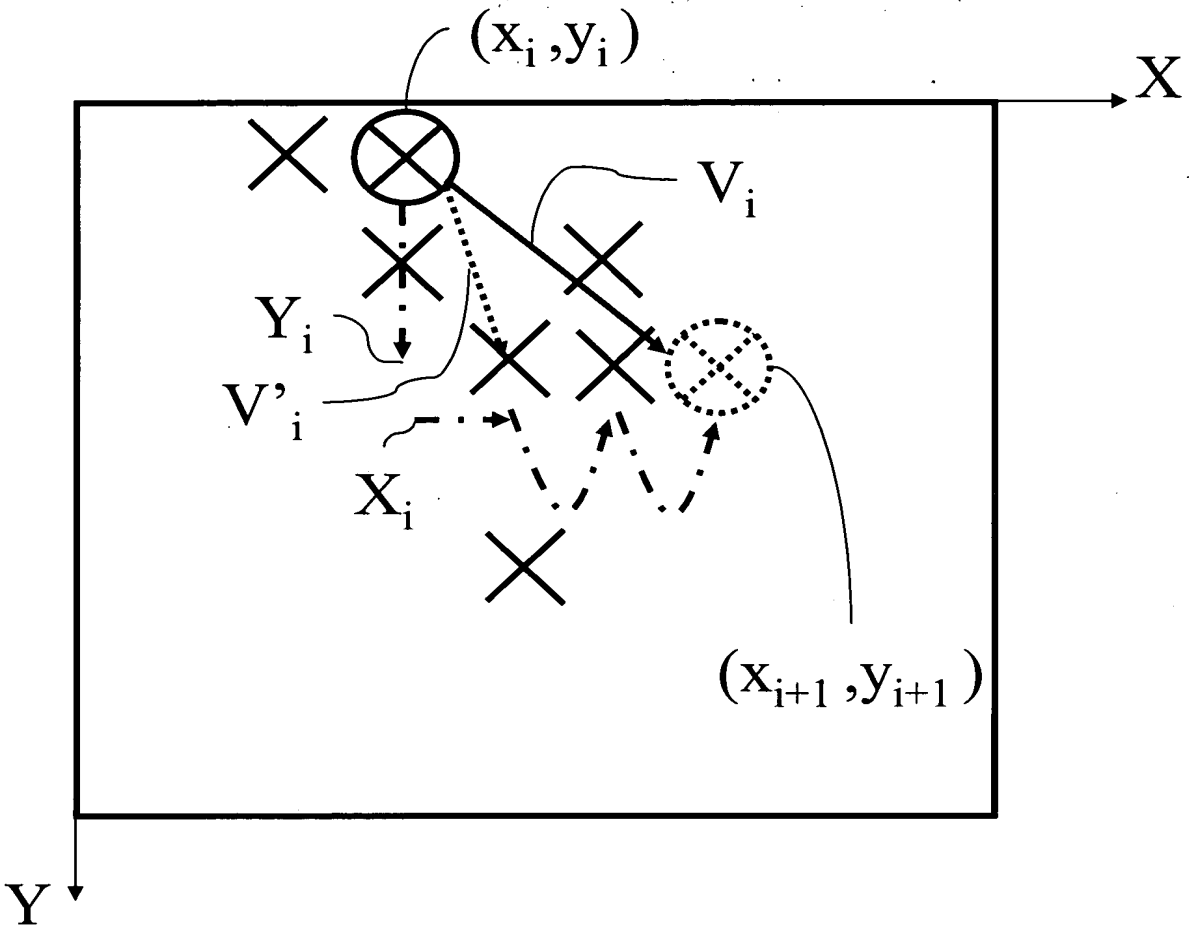

Figure 13

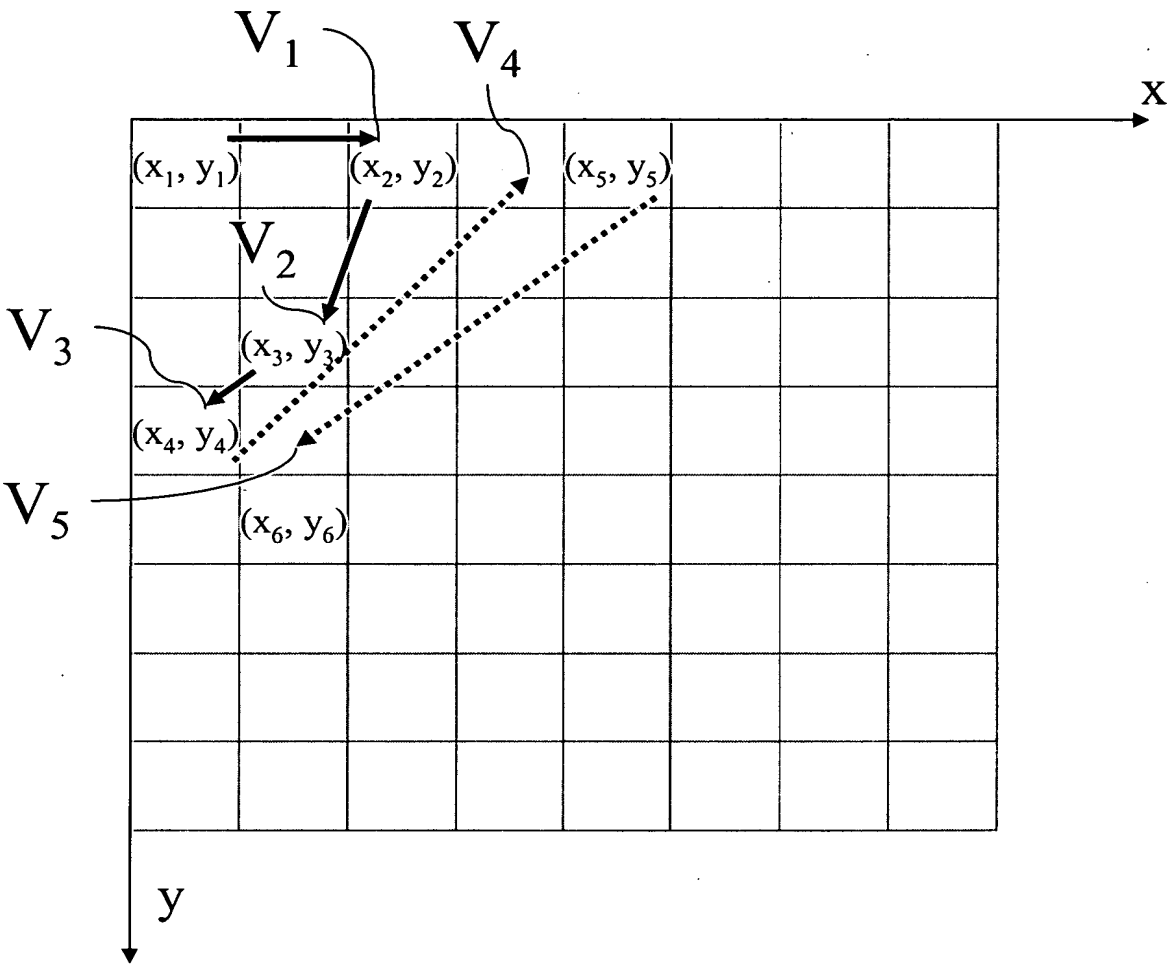

Figure 14

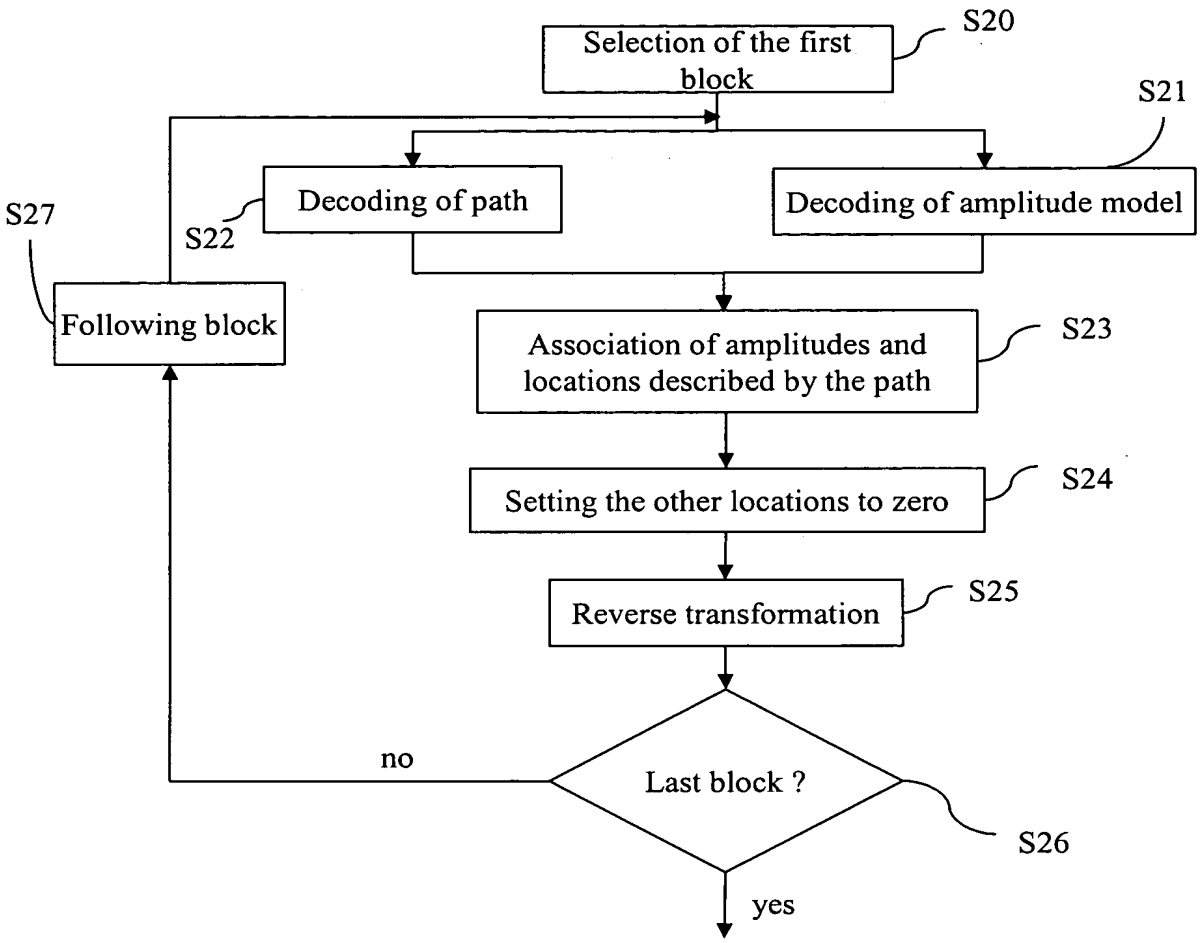
Selection of the first block
S20
S21
Decoding of path
Decoding of amplitude model
S22
S27
Following block
Association of amplitudes and locations described by the path
S23
Setting the other locations to zero
S24
Reverse transformation
S25
Last block ?
S26
no
yes

Figure 15

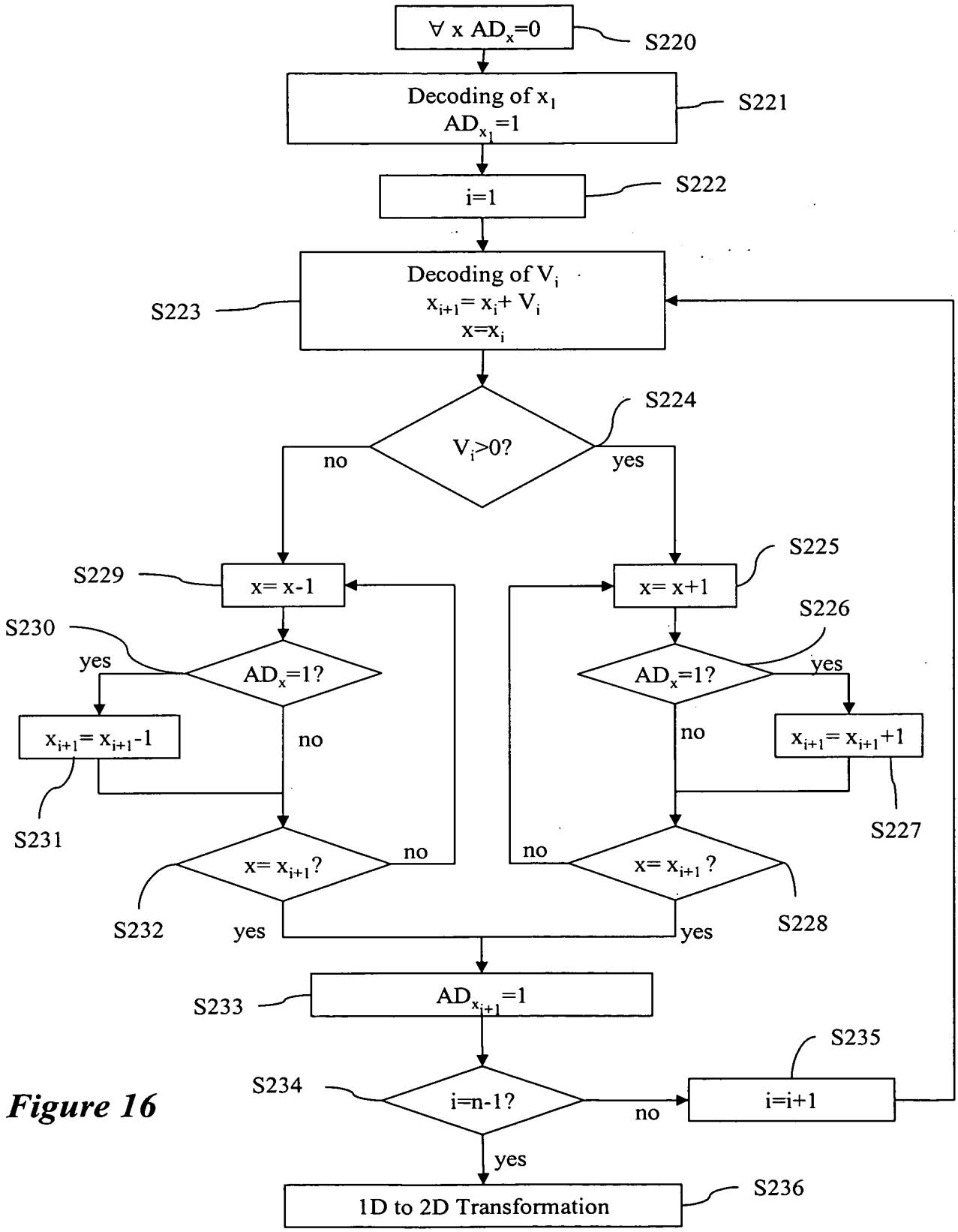
∀ x AD$_x$=0
S220
Decoding of x$_1$
AD$_{x_1}$=1
S221
i=1
S222
Decoding of V$_i$
x$_{i+1}$= x$_i$+ V$_i$
x=x$_i$
S223
V$_i$>0?
S224
no
yes
S229
x= x-1
S225
x= x+1
S230
AD$_x$=1?
yes
no
S226
AD$_x$=1?
yes
no
x$_{i+1}$= x$_{i+1}$-1
x$_{i+1}$= x$_{i+1}$+1
S231
S227
x= x$_{i+1}$?
no
S232
yes
x= x$_{i+1}$?
no
S228
yes
AD$_{x_{i+1}}$=1
S233
S234
i=n-1?
no
i=i+1
S235
yes
1D to 2D Transformation
S236

Figure 16

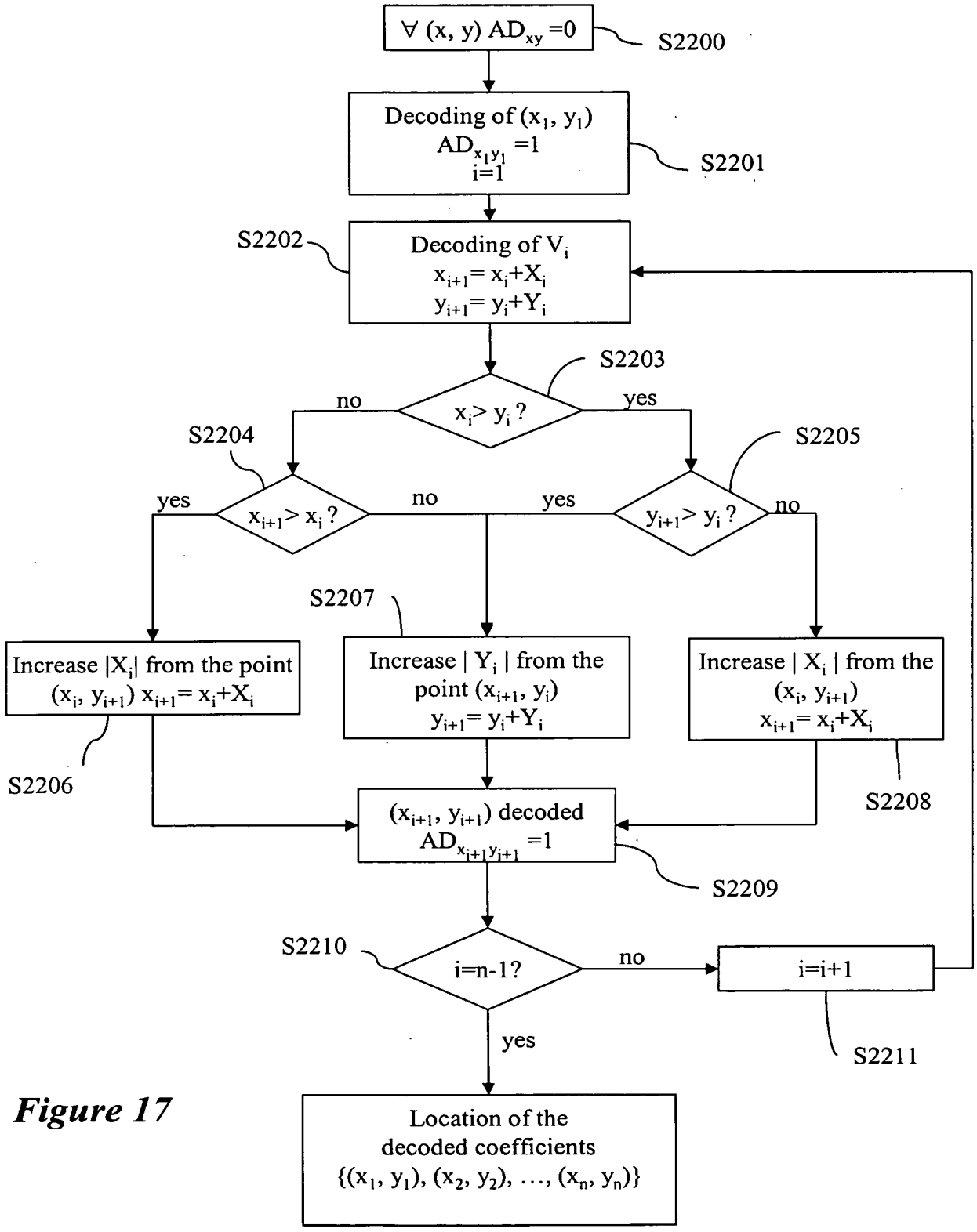
∀ (x, y) AD_{xy} =0
S2200
Decoding of (x_1, y_1)
$AD_{x_1y_1}$ =1
i=1
S2201
S2202
Decoding of V_i
$x_{i+1}= x_i+X_i$
$y_{i+1}= y_i+Y_i$
S2203
$x_i > y_i$?
no
yes
S2204
S2205
$x_{i+1} > x_i$?
$y_{i+1} > y_i$?
yes
no
yes
no
S2207
Increase $|X_i|$ from the point (x_i, y_{i+1}) $x_{i+1}= x_i+X_i$
Increase $|Y_i|$ from the point (x_{i+1}, y_i) $y_{i+1}= y_i+Y_i$
Increase $|X_i|$ from the (x_i, y_{i+1}) $x_{i+1}= x_i+X_i$
S2206
S2208
(x_{i+1}, y_{i+1}) decoded
$AD_{x_{i+1}y_{i+1}}$ =1
S2209
S2210
i=n-1?
no
i=i+1
S2211
yes
Location of the decoded coefficients
$\{(x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)\}$

Figure 17

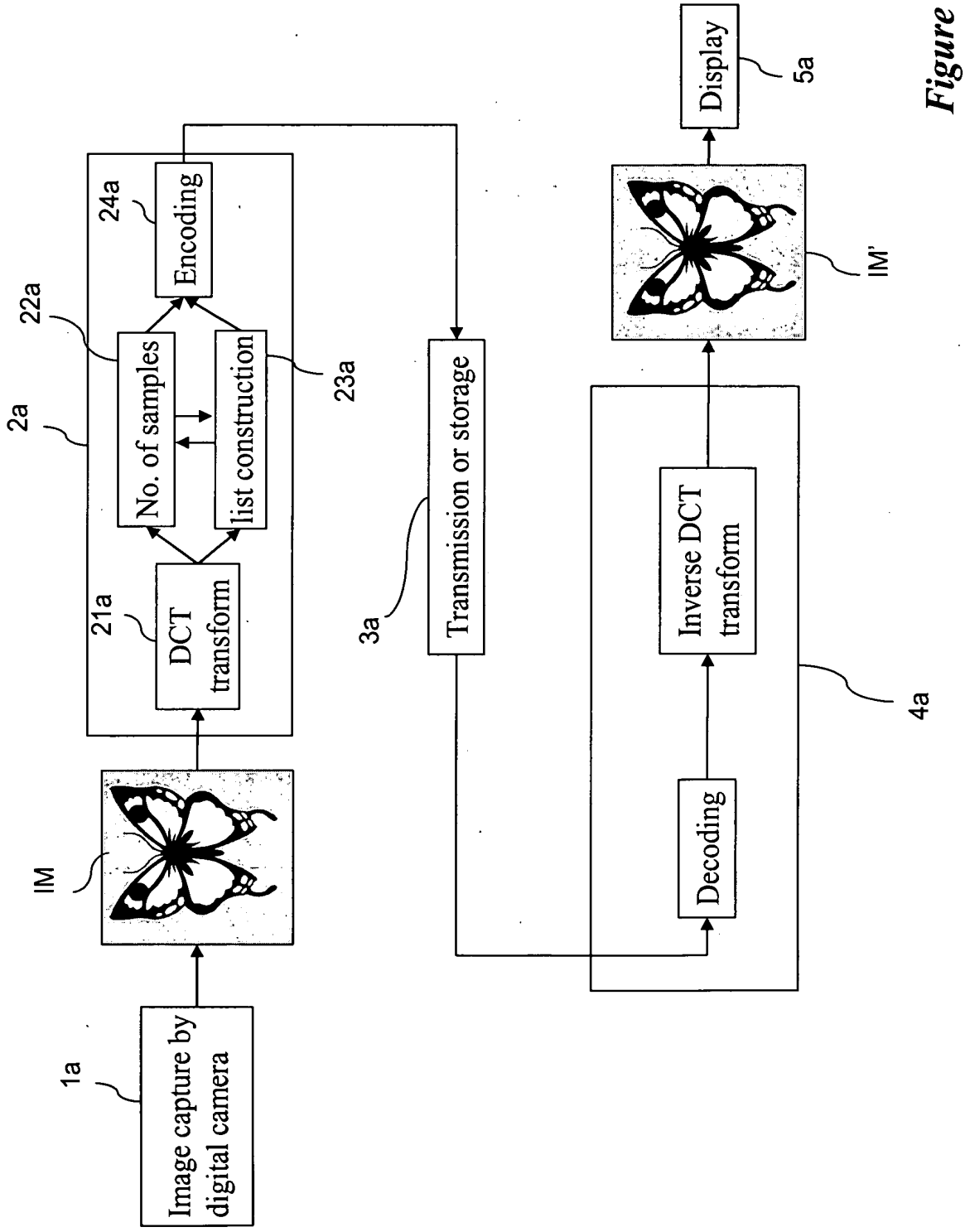
1a
Image capture by digital camera
IM
2a
21a
DCT transform
22a
No. of samples
23a
list construction
24a
Encoding
3a
Transmission or storage
4a
Decoding
Inverse DCT transform
IM'
5a
Display

Figure 18

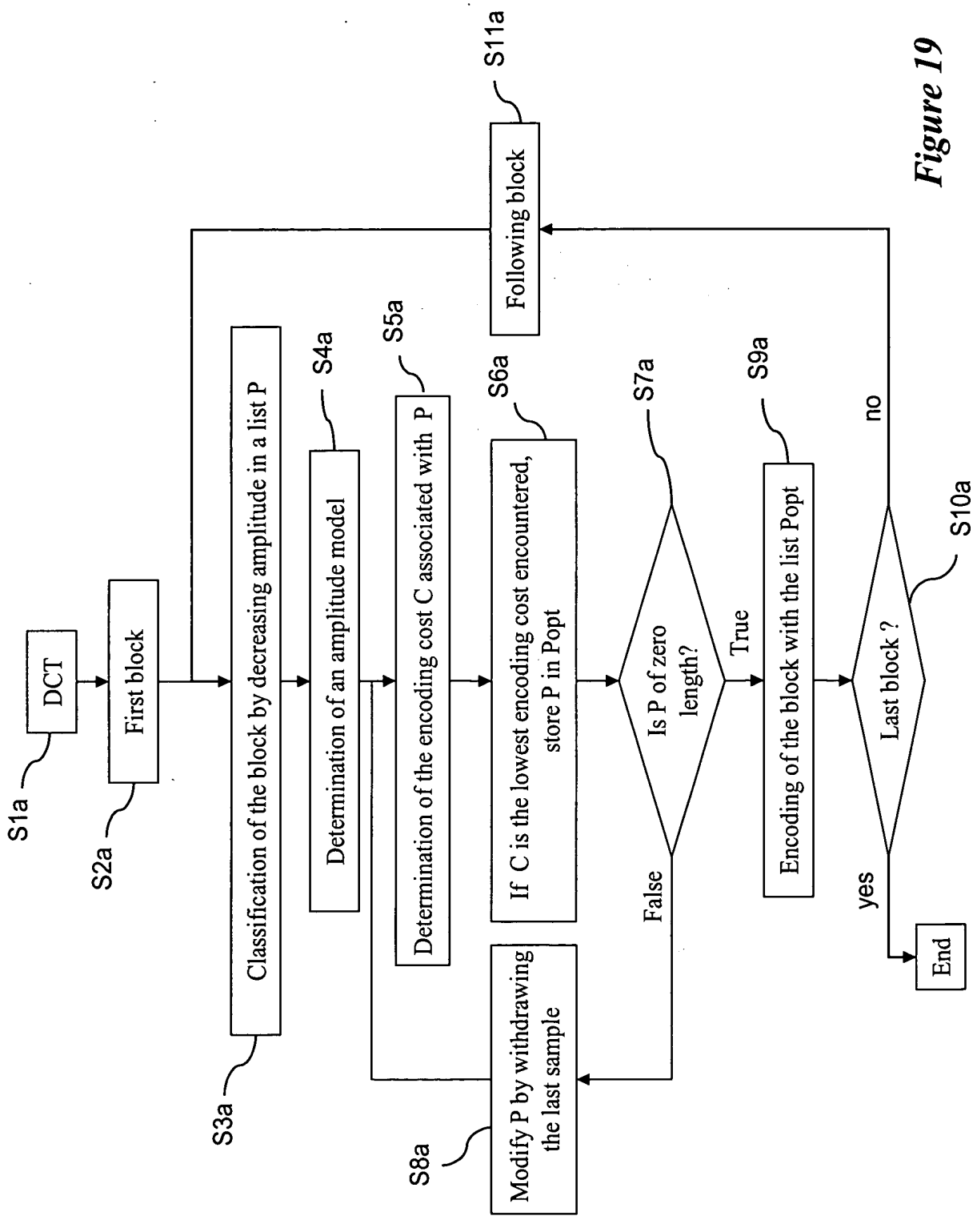
DCT
First block
Classification of the block by decreasing amplitude in a list P
Determination of an amplitude model
Determination of the encoding cost C associated with P
If C is the lowest encoding cost encountered, store P in Popt
Is P of zero length?
False
True
Encoding of the block with the list Popt
Last block ?
no
yes
End
Following block
Modify P by withdrawing the last sample
S1a
S2a
S3a
S4a
S5a
S6a
S7a
S8a
S9a
S10a
S11a

Figure 19

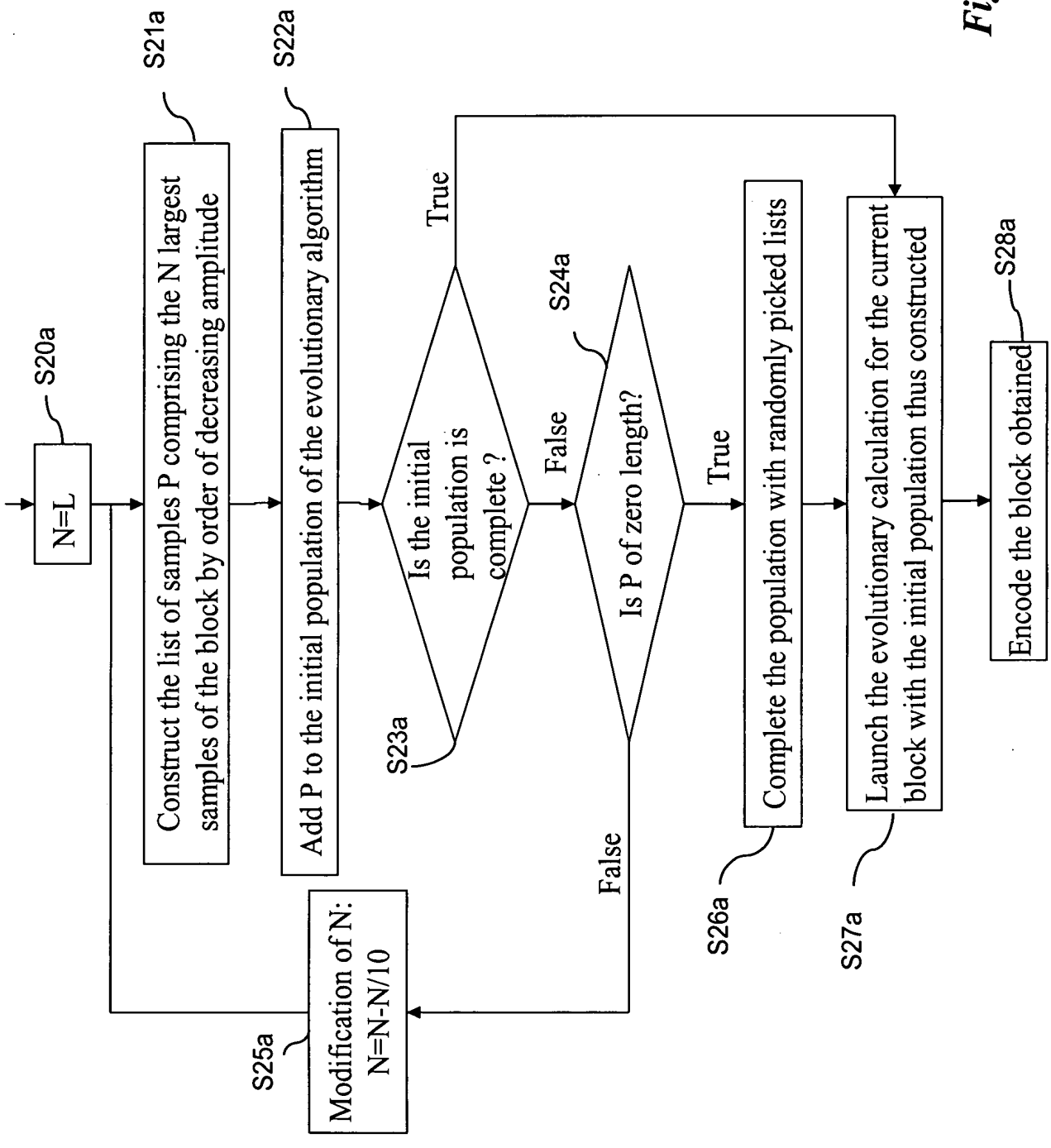
S20a
N=L
S21a
Construct the list of samples P comprising the N largest samples of the block by order of decreasing amplitude
S22a
Add P to the initial population of the evolutionary algorithm
S23a
Is the initial population is complete ?
True
False
S24a
Is P of zero length?
True
False
S25a
Modification of N: N=N-N/10
S26a
Complete the population with randomly picked lists
S27a
Launch the evolutionary calculation for the current block with the initial population thus constructed
S28a
Encode the block obtained

Figure 20

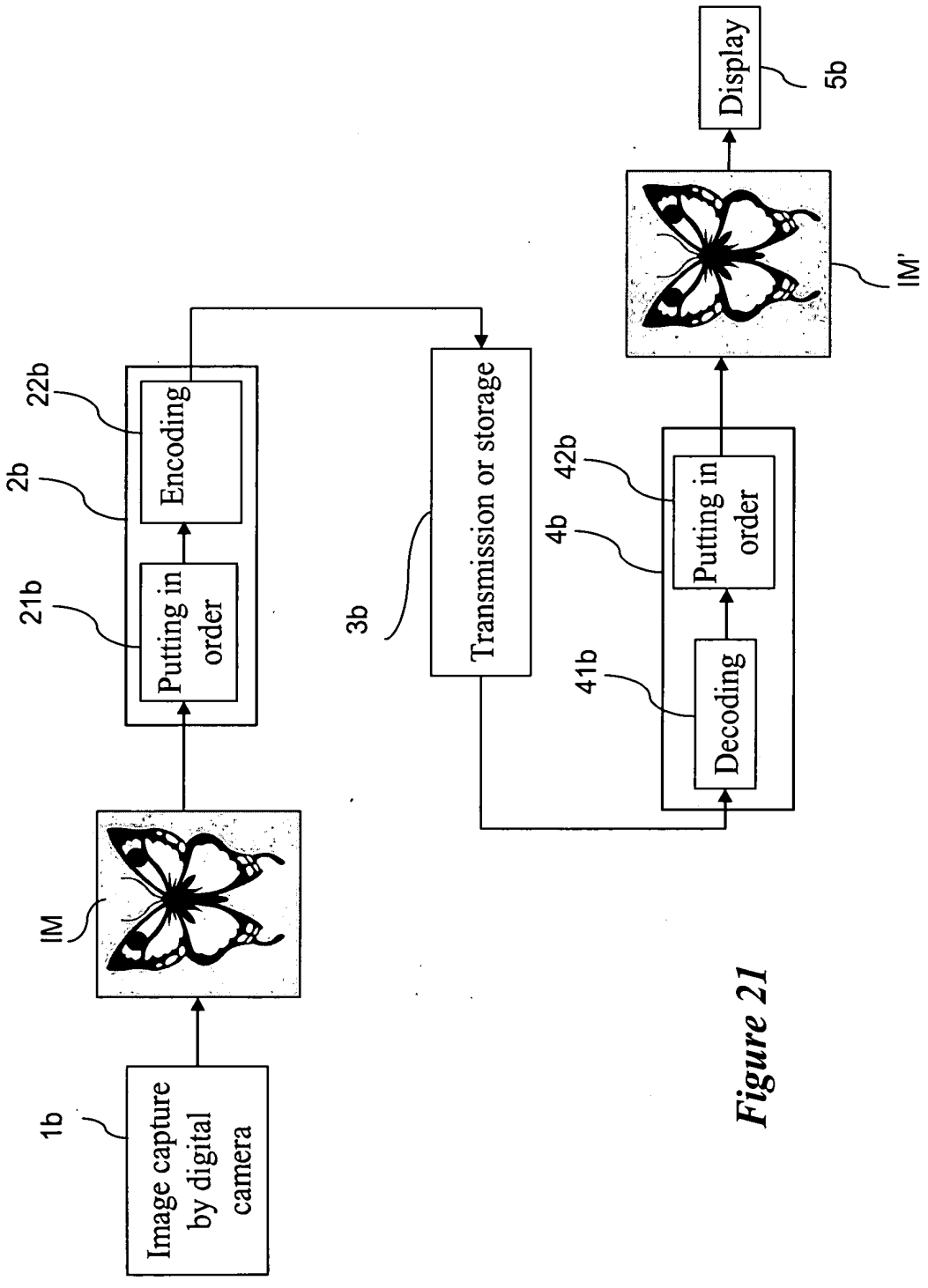
1b
Image capture by digital camera
IM
21b
Putting in order
2b
22b
Encoding
3b
Transmission or storage
41b
Decoding
4b
42b
Putting in order
IM'
5b
Display

Figure 21

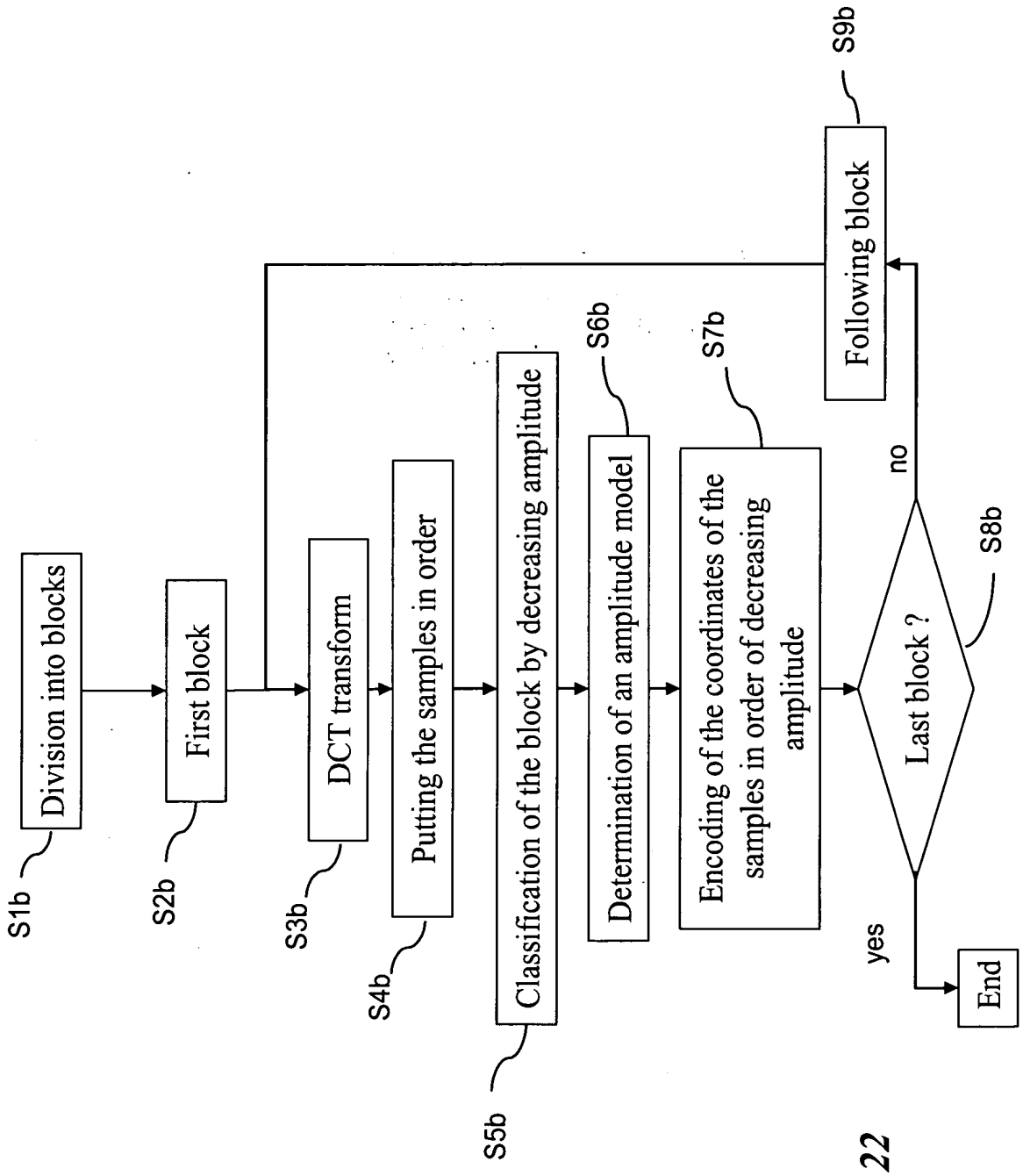
Division into blocks
First block
DCT transform
Putting the samples in order
Classification of the block by decreasing amplitude
Determination of an amplitude model
Encoding of the coordinates of the samples in order of decreasing amplitude
Last block ?
Following block
End
S1b
S2b
S3b
S4b
S5b
S6b
S7b
S8b
S9b
yes
no

Figure 22

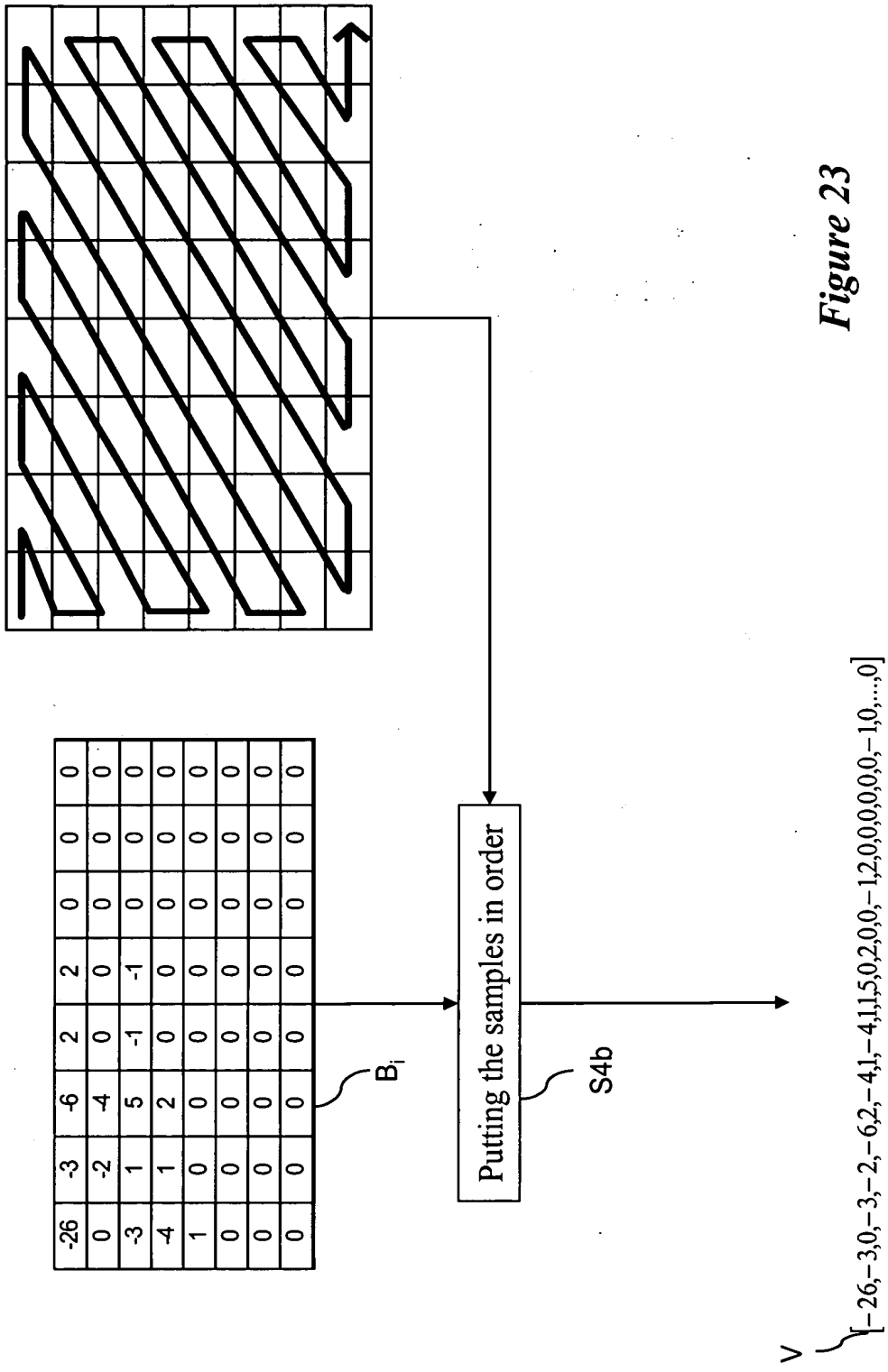
-26 -3 -6 2 2 0 0 0
0 -2 -4 0 0 0 0 0
-3 1 5 -1 -1 0 0 0
-4 1 2 0 0 0 0 0
1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
B_i
Putting the samples in order
S4b
V
[-26,-3,0,-3,-2,-6,2,-4,1,-4,1,1,5,0,2,0,0,-1,2,0,0,0,0,0,0,-1,0,...,0]

Figure 23

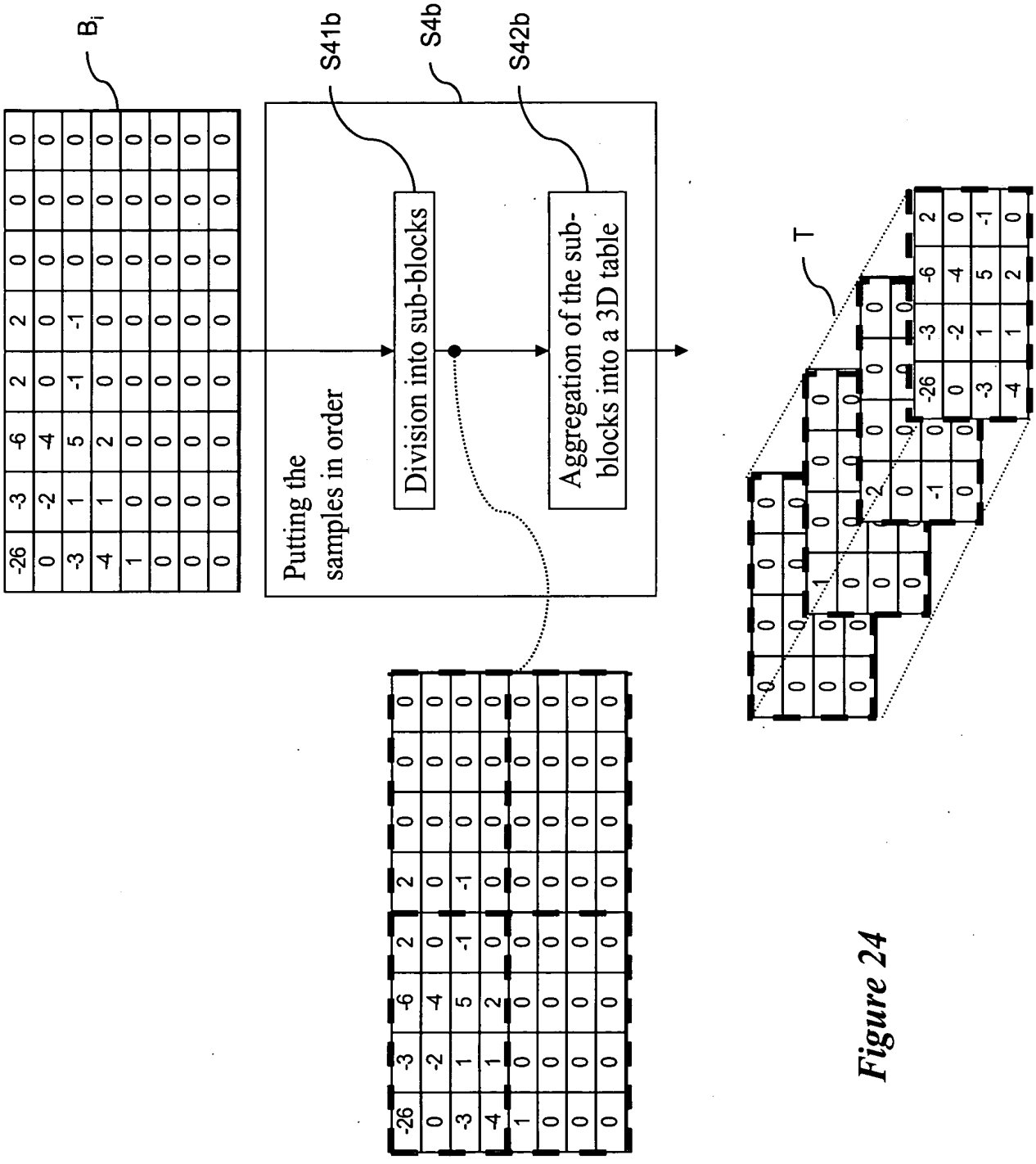
B_i
S41b
S4b
S42b
Putting the samples in order
Division into sub-blocks
Aggregation of the sub-blocks into a 3D table
T

Figure 24

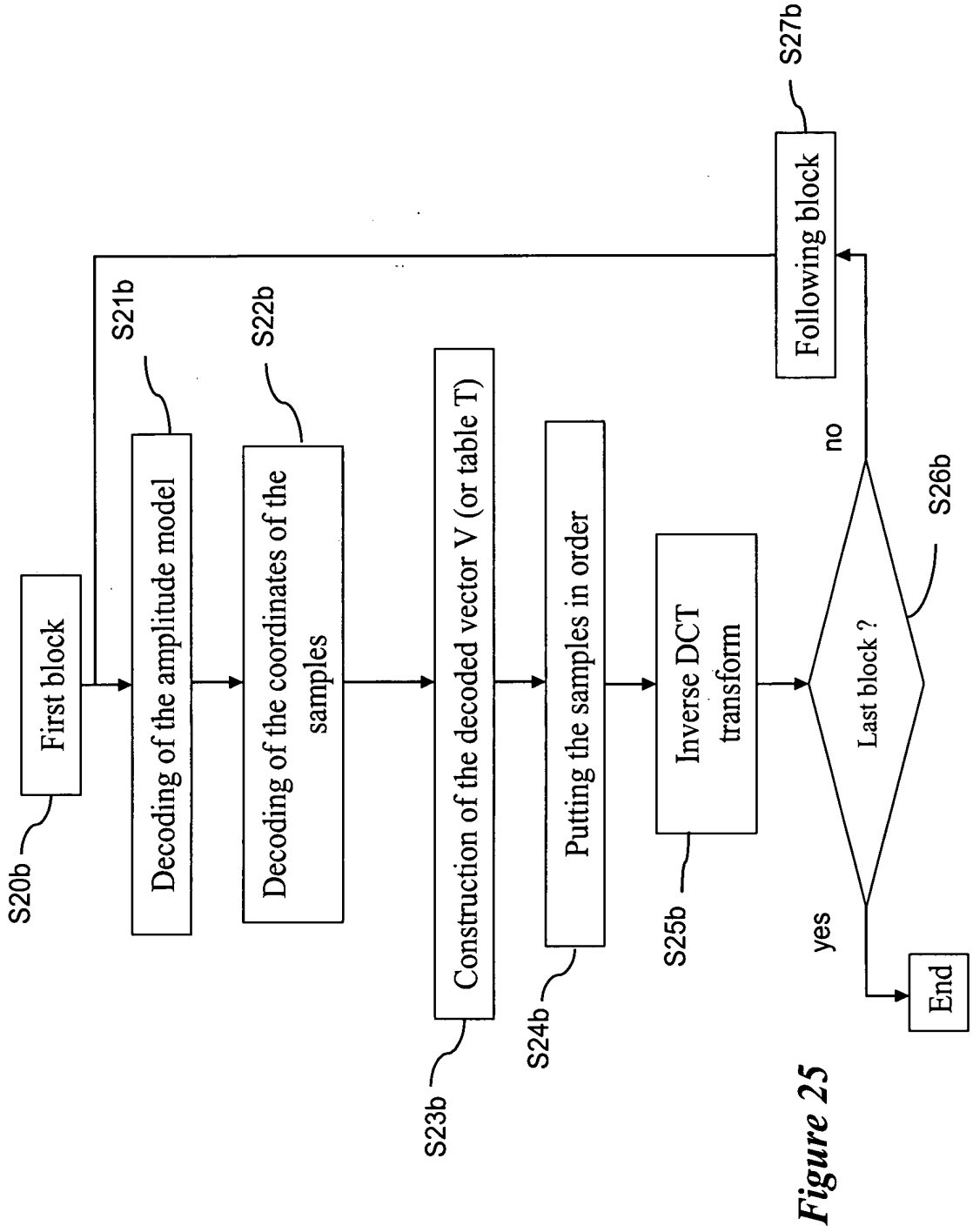
First block
S20b
Decoding of the amplitude model
S21b
Decoding of the coordinates of the samples
S22b
Construction of the decoded vector V (or table T)
S23b
Putting the samples in order
S24b
Inverse DCT transform
S25b
Last block ?
S26b
no
yes
Following block
S27b
End

Figure 25

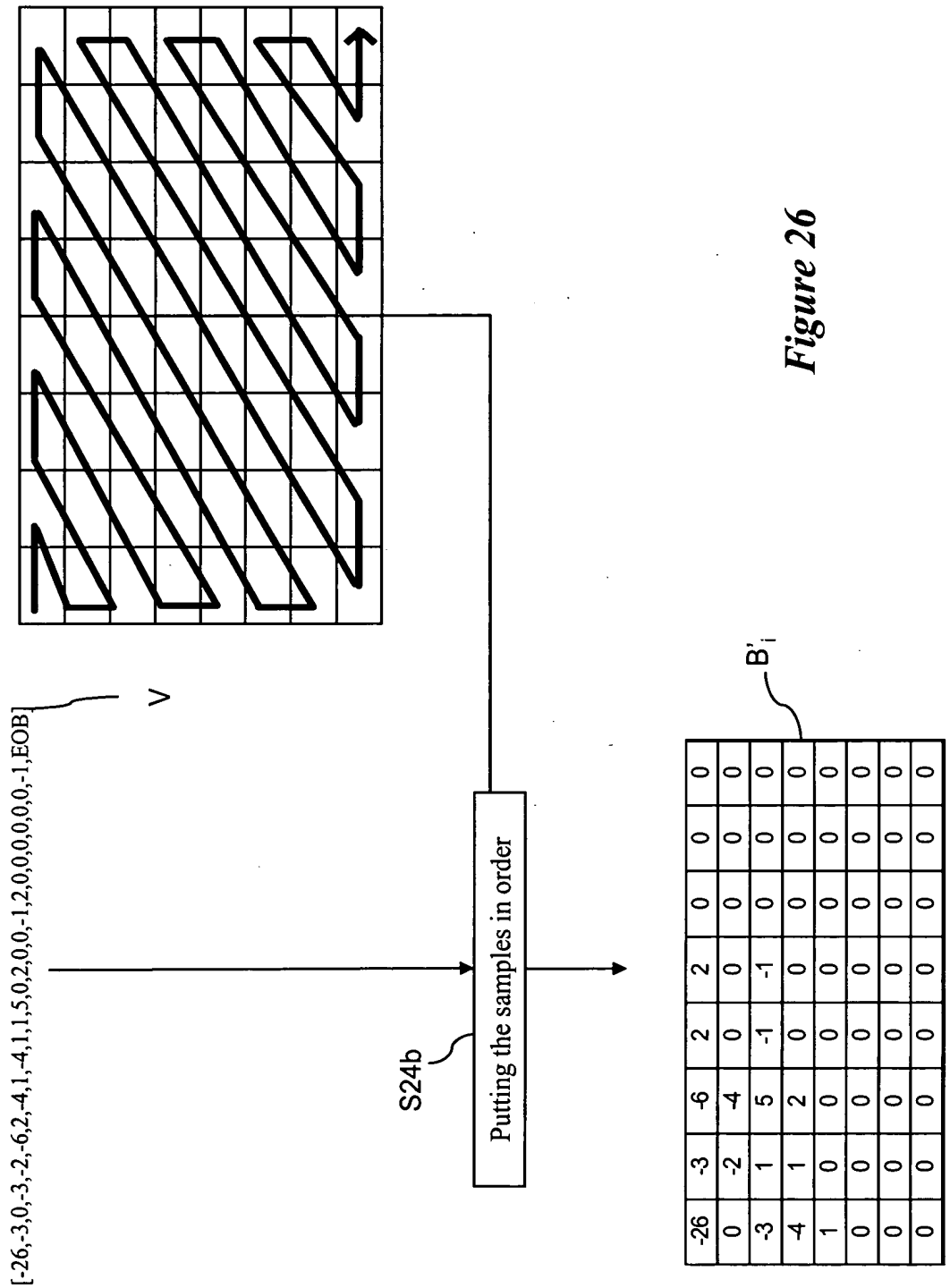
[-26,-3,0,-3,-2,-6,2,-4,1,-4,1,1,5,0,2,0,0,-1,2,0,0,0,0,0,-1,EOB]
V
S24b
Putting the samples in order
B'i
-26 -3 -6 2 2 0 0 0
0 -2 -4 0 0 0 0 0
-3 1 5 -1 -1 0 0 0
-4 1 2 0 0 0 0 0
1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

Figure 26

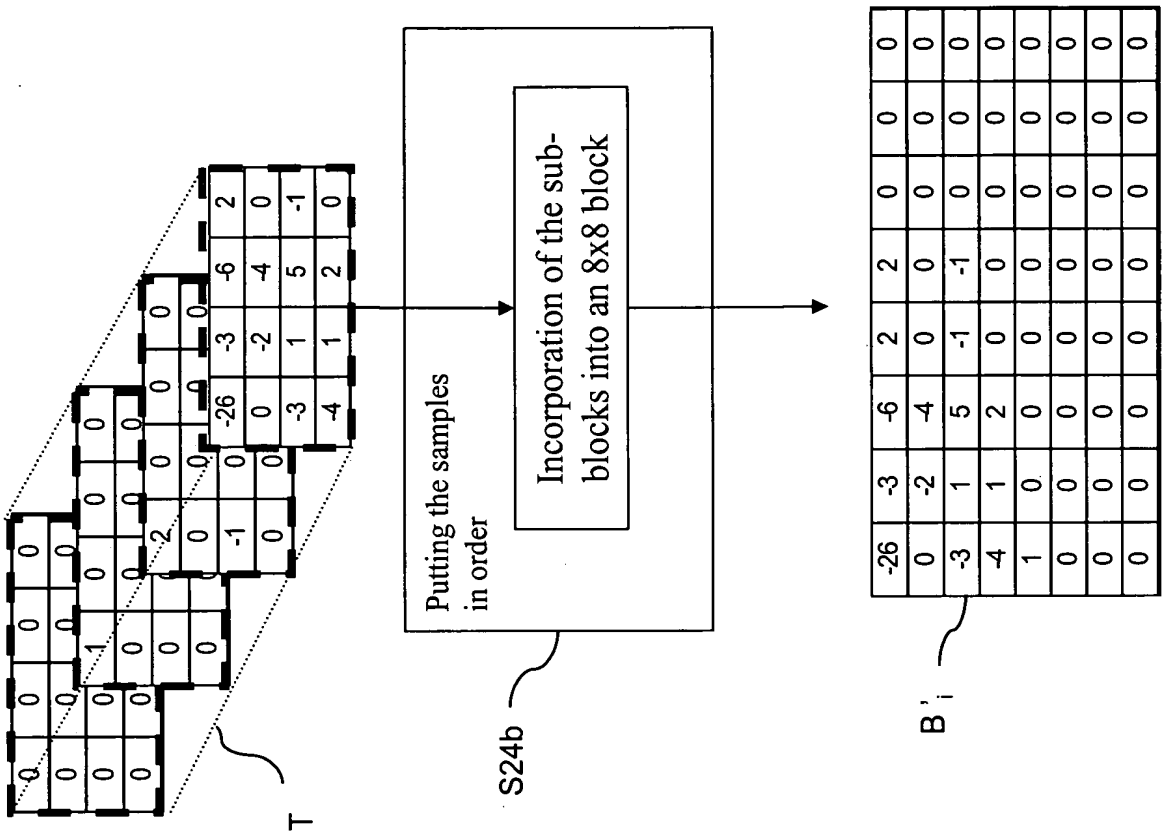
T
S24b
Putting the samples in order
Incorporation of the sub-blocks into an 8x8 block
B'i

Figure 27